

author of an improvement of steam-engines, or of any other invention contributing most to the progress of steam navigation.

4. The Bordin prize, a medal of 3,000 francs value, will be awarded for a satisfactory solution of the following problem:—To find the means of destroying, or at least seriously diminishing, the annoyance and the dangers arising from the products of combustion issuing from the chimneys of locomotive engines, steamships, and manufactories near towns.

III. ASTRONOMY.—1. The Lalande prize, a medal of 542 francs value, will be awarded to the person who shall have made the most interesting observation, or to the memoir or the work most contributing to the progress of astronomy. 2. The Damoiseau prize, a medal of 5,000 francs value, will be awarded (in 1879) for a solution of the following question:—Revise the theory of the satellites of Jupiter; discuss the observations, and deduce from them the constants they contain, and particularly that which furnishes a direct determination of the rate of light; finally, construct special tables for each satellite. 3. The Valz prize, the proceeds of a sum of 10,000 francs, will be awarded for the most interesting astronomical observation made during the year.

IV. PHYSICS.—The Bordin prize, a medal of 3,000 francs value, will be awarded for a solution to the following:—Various formulæ have been proposed to replace Ampère's law on the action of the elements of currents; discuss these various formulæ and the reasons which may be alleged for giving the preference to one of them. 2. Three Lacaze prizes of 10,000 francs each will be awarded (in 1879) to the works or memoirs which have contributed most to the progress of physiology, physics, or chemistry.

V. CHEMISTRY.—The Jecker prize of 10,000 francs will be awarded to the researches which the Academy judges best calculated to accelerate the progress of organic chemistry.

VI. BOTANY.—1. The Barbier prize of 2,000 francs will be awarded to anyone who makes a valuable discovery in surgery, medicine, pharmacy, or botany, in connection with the art of healing. 2. The Alhumbert prize, a medal of 2,500 francs value; the subject of this prize is a study of the mode of nutrition of fungi. 3. The Desmazières prize of 1,600 francs will be awarded to the best or most useful writing on the whole or part of cryptogamy published during the year. 4. The Shore prize of 200 francs will be awarded to the author of the best memoir on the cellular cryptogams of Europe, or on the habits or anatomy of a European species of insect. 5. The Bordin prize of 3,000 francs has for its subject the following:—Explain by direct observations and by experiments the influence which the medium exercises on the structure of plant organs (roots, stem, leaves); study the variations which terrestrial plants undergo when raised in water and those which aquatic plants undergo when forced to live in air. Explain by direct experiments the special forms of several species of maritime flora.

In medicine and surgery the Bréant prize of 100,000 francs for a cure for Asiatic cholera still stands.

One or more Montyon prizes are awarded to works or discoveries which show the means of rendering an art or occupation less insalubrious.

The competition closes on June 1 each year. Works sent in are not returned, and the conditions as to the use of mottoes, concealment of names, &c., usual to such competitions are required.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

SCIENCE IN SCHOOLS.—Sir John Lubbock has given notice on an early day to move in the House of Commons that it would be desirable to modify the Code of Education by adding elementary natural science to the subjects mentioned in Article 19, c. I.

BRESLAU.—The number in attendance at the University during the present winter is 1,253, divided as follows among the faculties:—Theological, 101; legal, 432; medical, 168; philosophical, 552. The University possesses one of the most valuable libraries in Germany, numbering over 400,000 volumes and several thousand valuable manuscripts.

BERN AND ZÜRICH.—The former University is attended at present by 410 students, the latter by 318. Each University includes in its list nineteen female students, most of whom are preparing for medical examinations.

LIBRARIES OF GERMAN AND AUSTRIAN UNIVERSITIES.—Most of the German States place annually considerable sums at the disposal of the University libraries. Bavaria gives her universities each 1,000*l.* for this purpose; Saxony grants 1,200*l.* to Leipzig; while in Prussia the sums vary from 600*l.* for Greifswald to 2,000*l.* for Göttingen. In Austria, although the existence of so many different languages in the empire makes special demands on the university libraries, the Government assistance has hitherto been exceedingly limited. We notice, however, that in a late session of the Reichstag a new policy has been adopted, and that the annual grants have been raised to 1,500*l.* for the Vienna library, 1,000*l.* for that at Prague, and 800*l.* for those in the other universities.

ST. PETERSBURG.—On January 1, 1878, the University at St. Petersburg numbered 1,425 students, thirty-seven more than last year. One-seventh are in the department of History and Philology, three-sevenths in Natural Sciences and Mathematics, three-sevenths in Law, and one-forty-seventh in Asiatic languages. The number of professors is ninety-three. The students are mostly very poor, and the pecuniary help given to them by the University amounted during the year to the sum of 12,000*l.*; besides which, a private society of former students paid the fees for eighty-one persons.

KIEFF.—The University celebrated, during the past month, the fifty-ninth year of its existence. Although so young it is well equipped with all the necessary adjuncts of a university, and its medical faculty is regarded as the first in Russia. The number of students at present is 773, an increase of 160 on the previous year. The majority are in the medical faculty. As in the other Russian universities, the students are recruited principally from the poorer classes, 203 being freed from the payment of lecture-fees, and 123 in addition receiving stipends amounting in the total to 36,000 roubles. A high school for ladies is at last to be opened at the University.

SCIENTIFIC SERIALS

Reale Istituto Lombardo di Scienze e Lettere. Rendiconti, vol. x. Fasc. xix.—Reduction of chlorates to chlorides without intervention of the so-called nascent state of hydrogen (second part), by M. Tommasi.—On the cooling of pulverulent metallic solids, by M. Cantoni.—On temperature in relation to actual energy and the state of aggregation, by M. Grassi.—Measurement of the resistance and graduation of any galvanometer, by M. Grassi.—A school experiment and means of evaporating rapidly large quantities of liquid, by M. Brugnattelli.

Fasc. xx.—Other experiments on the evaporation of a liquid, by M. Cantoni.—Hypertrophy and hyperplasia, by M. Sangalli.—On the first and most recent appearance in Lombardy of the Beccafico of Provence.

Kosmos, November, 1877.—On the relation of Greek natural philosophy to modern natural science, by Prof. F. Schultze. Part 1, on the Ionic physiologists and the Pythagoreans.—On a mathematical law applicable to the theory of mutation, by J. Delboeuf.—On the variations of size of coloured floral envelopes, and their effect on the natural selection of flowers, by Hermann Müller.—A turning point in the early history of the human race, by J. H. Becker. Part 1, on the state of things preceding the turning point (before the discovery and use of fire).

December, 1877.—F. Schultze, on the relation of Greek natural philosophy to modern natural science, part 2, discussing Heraklitus and the Eleatic school.—W. Preyer, on the nature of life.—Fritz Müller, observations on Brazilian butterflies, part 3, dealing with the evolution of the *Maracuja* butterflies, and the phenomena presented by their larvæ, pupæ, and adult forms.—A. Maurer, on the origin of articulate sounds.—J. H. Becker, on the separation and reunion of races.—The number also contains a review of Mr. Darwin's work on the different forms of flowers, by Hermann Müller.

SOCIETIES AND ACADEMIES LONDON

Geological Society, February 6.—Prof. P. M. Duncan, F.R.S., president, in the chair.—James Adey Birds, Rev. George E. Comerford-Casey, M.A., Lieut.-Col. H. H. Godwin-Austen, Sir Willoughby Jones, Bart., and Henry Richard Ladell, M.A., were elected Fellows of the Society.—The following communi-

cations were read:—On some foraminifera from pleistocene beds in Ischia, by M. Ernest Vanden Broeck. Preceded by some geological remarks by A. W. Waters, F.G.S.—On the influence of the advent of a higher form of life in modifying the structure of an older and lower form, by Prof. Owen, C.B., F.R.S. In this paper the author, after referring to the general question of the modification of the structure of organic forms produced by the action of external influences, indicated that, in connection with this, changes in the nature of the prey of carnivorous animals ought to be taken into consideration. He inferred that cold-blooded aquatic animals formed a much greater proportion of the food of mesozoic than of neo-zoic crocodiles, and pointed out as connected therewith the well-marked distinction between the amphi-celcian and procelcian type of vertebræ respectively characteristic of the two groups. The procelcian character of the trunk-vertebræ better adapts that part of the body to be sustained and moved in air, and may be connected with the incoming in tertiary times of mammalian prey inducing the crocodiles to rush on shore. The mesozoic crocodiles were encased in a much stronger and more complete dermal armour than their successors, doubtless for their protection from the great ichthyosaurs, pliosaurus, &c., which co-existed with them; but as these passed away at the close of the secondary epoch, the armour of the procelcian crocodiles has become more scanty, and the diminution of weight and rigidity thus caused would favour progression in air, and the rapidity of movement required for capturing mammalian prey on land. The difference in the position of the palatognathes, and in other related gular and palatal structures, between the mesozoic and neo-zoic crocodiles is apparently connected with the power possessed by the latter of holding submerged a powerful mammal without permitting the access of water to the posterior nostrils and windpipe of the crocodile; and hence the author is inclined to ascribe a fish-diet even to those massive-jawed crocodiles from the Purbeck (such as *Goniopholis crassidens* and *sinus*), which in some respects might seem fitted to grapple with large and active mammals. The small size of the upper temporal apertures in tertiary and existing crocodiles is regarded by the author as a further proof in the same direction; these apertures are reduced by the progressive increase of the osseous roof of the temporal vacuities, which again is correlated with increase in the bulk and power of the temporal muscles, the main agents in biting and holding. The differences in the length and strength of the jaw, as a rule, testify in the same direction. Further, the fore limbs in mesozoic crocodiles are shorter than in neo-zoic species, indicating that the former were more strictly aquatic in their habits; the forelimbs in all crocodiles being closely applied to the body during rapid swimming, and small limbs being less obstructive than larger ones. On the other hand, they would be less efficient as a means of progression on land, and hence it may be inferred that the advent in tertiary times of mammals frequenting the water-side, tempting the crocodiles to make a rush upon the land to seize such passing prey, would lead to such strenuous action of the fore-limbs as would account for the increased size and power of those organs in the neo-zoic species. The author concluded with some remarks upon the influence of the above considerations upon our views as to the generic divisions of crocodiles.—Notes on a supposed crocodilian jaw from the coral rag of Weymouth, by E. Tully Newton, F.G.S., of H.M. Geological Survey. In this paper the author describes what he believes to be a fragment of a lower jaw of a crocodilian, obtained from a greyish brown sandy grit, probably belonging to bed 3 of Messrs. Blake and Huddleston's Sandford-Castle section.—Note on two skulls from the Wealden and Purbeck formations indicating a new sub-group of crocodilia, by J. W. Hulke, F.R.S., F.G.S. The author described a crocodilian skull obtained by Mr. H. Willett, F.G.S., from the Hastings sands near Cuckfield, in Sussex, and identified by that gentleman with *Goniopholis crassidens*, Owen; and another from the Purbecks near Swanage, in the collection of the British Museum, which he further compared with a third specimen from Brook, in the Isle of Wight.

February 15.—Annual General Meeting.—Prof. P. M. Duncan, F.R.S., president, in the chair.—The Secretaries read the Reports of the Council and of the Library and Museum Committee for the year 1877. The Society was described as in an exceedingly prosperous condition, and the income of the year was stated to have considerably exceeded the expenditure. The number of Fellows elected was fully up to the average. The Report further announced the receipt of a bequest of 500*l.* under

the will of the late Mr. C. Lambert, which sum, with 150*l.* of the surplus of income, had been invested in consols for the benefit of the Society.—The Wollaston Gold Medal was presented to Dr. Thos. Wright, F.R.S., for his varied palæontological researches.—The President then presented the balance of the proceeds of the Wollaston Donation Fund to Mr. W. J. Sollas, M.A., F.G.S., in recognition of his careful morphological and mineralogical studies upon the fossil Spongida.—The President next handed the Murchison Medal to Mr. Warrington W. Smyth for transmission to Dr. Hanns Bruno Geinitz, of Dresden for his researches in the geology and palæontology of the palæozoic and cretaceous formations of Saxony; and the balance of the proceeds of the Murchison Geological Fund to Mr. H. Hicks, F.G.S., for transmission to Mr. Charles Lapworth, F.G.S., for a most important communication upon the Silurian rocks of the South of Scotland, and the graptolites contained in them.—The President next handed to Mr. J. W. Hulke, F.R.S., the Lyell Medal and part of the Lyell Fund for transmission to Mr. George Busk, F.R.S., as a token of the Council's appreciation of his merits as a palæontologist.—The balance of the proceeds of the Lyell Fund was handed to Dr. Oldham, F.R.S., F.G.S., for transmission to Dr. W. Waagen, of Vienna, and who was lately on the Geological Survey of the East Indies. Dr. Waagen's labours in India have commended themselves to the Council on account of their great merit and interest.—The President then proceeded to read his anniversary address, in which he dwelt in considerable detail upon the influence of advanced morphological and zoological investigations upon our palæontological ideas and upon the geological inferences founded upon them.—The ballot for the Council and Officers was taken, and the following were duly elected for the ensuing year:—President, H. C. Sorby, F.R.S. Vice-Presidents: R. Etheridge, F.R.S., John Evans, F.R.S., Prof. J. Prestwich, F.R.S., Prof. A. C. Ramsay, F.R.S. Secretaries: Prof. T. G. Bonney, M.A., Prof. J. W. Judd, F.R.S. Foreign Secretary: Warrington W. Smyth, F.R.S. Treasurer: J. Gwyn Jeffreys, F.R.S. Council: H. Baerman, Prof. T. G. Bonney, M.A., Prof. W. Boyd Dawkins, F.R.S., Prof. P. Martin Duncan, F.R.S., R. Etheridge, F.R.S., John Evans, F.R.S., Henry Hicks, W. H. Huddleston, M.A., Prof. T. McKenny Hughes, M.A., J. W. Hulke, F.R.S., J. Gwyn Jeffreys, F.R.S., Prof. T. Rupert Jones, F.R.S., Prof. J. W. Judd, F.R.S., J. Morris, J. A. Phillips, Prof. J. Prestwich, F.R.S., F. G. II. Price, Prof. A. C. Ramsay, F.R.S., R. H. Scott, F.R.S., Warrington W. Smyth, F.R.S., H. C. Sorby, F.R.S., Admiral T. A. B. Spratt, C.B., F.R.S., Rev. T. Wiltshire, F.I.S.

Zoological Society, February 19.—Prof. Mivart, F.R.S., vice-president, in the chair.—The Secretary exhibited the skin of a fine adult cassowary, which had been obtained at Wandamen, on the eastern coast of the Bay of Geelvinck, New Guinea, and had just been acquired by the British Museum. The species to which it belonged was believed to be undescribed, and was proposed to be called *C. altijugus*, from its peculiar high-peaked helmet.—Mr. P. Geddes read a memoir on the mechanism of the odontophore in certain mollusca. In this paper the view of Cuvier—that the movements of the radula depend upon those of the underlying cartilages—was substantially revived, arguments being adduced against the more recent theory of Prof. Huxley, that it runs like a chain-saw, the cartilages merely forming a pulley-block. The use of bacteria as food by *Lymnaea* was also described by the author in this paper.—Prof. A. H. Garrod, F.R.S., read some notes on the anatomy of *Tolypterus tricus*, and gave remarks on other *Dasyopodidae*. A new form of *Tolypterus*, allied to *T. conurus*, was proposed to be called *T. muriei*.—A communication was read from Mr. J. H. Gurney, F.Z.S., containing notes on a specimen of *Polyborus*, lately living in the Society's Gardens.—A communication was read from Mr. D. G. Elliott, F.Z.S., containing the results of his study of the *Pteroclidæ*, or family of sand grouse. Nine species of *Pterocles* and two of *Syrhaptes* were recognised as composing the family.—Messrs. F. Du Cane Godman and Osbert Salvin gave descriptions of new species of diurnal lepidoptera from Central America.—A communication was read from Mr. R. Bowdler Sharpe, giving an account of a small collection of birds from the Ellice Islands.—Mr. Edward R. Alston read a note on the denition of *Cuscus*.—A communication was read from Mr. T. F. Cheeseman, containing the description of three new species of Opisthobranchiate mollusca from New Zealand.—Dr. F. Day communicated some remarks on the paper read by Mr. Whitmee

at the last meeting of the Society, on the manifestations of fear and anger by fishes.—A communication was read from the Marquis of Tweeddale, F.R.S., containing an account of a collection of birds made by Mr. A. H. Everett, in the Island of Negros, Philippines.—A second communication from the Marquis of Tweeddale contained the description of a new species of the genus *Buceros*, proposed to be called *B. semigaleatus*, from the Island of Leyle, Philippines.

Mineralogical Society, February 19.—Mr. H. C. Sorby, F.R.S., president, in the chair.—The president read a valuable and important paper on the determination of the minerals in thin sections of rocks by means of their refractive indices. In this paper he showed how the refractive indices might be determined with great accuracy in sections less than $\frac{1}{100}$ of an inch in thickness, cut for ordinary microscopic purposes.—The Rev. T. G. Bonney then read a paper on some specimens of Gabbro from the Pennine Alps, in which he pointed out the great changes which these rocks had undergone, and their similarity to the rocks of the Lizard district in Cornwall.—Mr. J. H. Collins read a paper on the classification of minerals, in which he advocated a primary chemical and a secondary mixed system of classification. This paper elicited an interesting discussion. Specimens in illustration of their papers were exhibited by the president and by the Rev. T. G. Bonney.—Dr. Foster exhibited specimens of carbonate of bismuth, and other minerals from new Cornish localities.

Photographic Society, February 12.—Annual Meeting.—James Glaisher, F.R.S., president, in the chair.—A silver progress medal was awarded to Capt. Abney, R.E., F.R.S., for having made the greatest advance in the science of photography during the past year.—Capt. Abney exhibited a very large positive photograph taken from one of Janssen's negatives of the sun, which were taken by a five-inch telescopic objective of about seven feet focal length, corrected for the chemical, but not for the visual rays.—Mr. Edward Viles exhibited the micro-photographic apparatus by which the large photograph (recently seen at the exhibition) of the proboscis of the blow-fly enlarged 200 diameters, was taken, the mechanism and use of the heliostat being minutely described.—Capt. Abney also exhibited and described two other forms of heliostats which he had used.

PARIS

Academy of Sciences, February 25.—M. Fizeau in the chair.—The President announced the opening of a subscription for a statue to M. Leverrier. The following papers were read:—On the carburization of nickel by the process of cementation, by M. Boussingault. Though combining with carbon, nickel does not acquire, like iron, the properties found in steel; nor is the cemented nickel rendered less oxidable. (M. Becquerel is examining its magnetic properties.)—On a new product of oxidation of lead, and on some phenomena of dissociation, by M. Debray. Sesquioxide of lead is transformed, gradually at 350°, and rapidly at 440° into minium, which is not susceptible of being hyperoxygenated in air, or even in pure oxygen. It cannot be said that any compound formed directly will necessarily undergo a limited decomposition at a given temperature.—Imitation of the characteristic cupules and erosions found on the surface of meteorites in an industrial operation, by action of a rapid current of air on incandescent stones, by M. Daubrée. In a new mode of manufacture of Portland cement, the stones raised to white heat are subjected to a current of cold air; the specimen (furnished by M. Hauenschild) showed a surface very like that of meteorites.—Note on a new brochure of M. Hirn on music and acoustics, by M. Faye.—On the recent communication of M. Broun, and a note of Mr. Jenkins relating to sun-spots and terrestrial magnetism, by M. Faye.—On telephones with battery, by M. Du Moncel. The author hopefully calls attention to MM. Pollard and Garnier's attempts to strengthen the sound; the sending telephone being on Edison's graphite system, while the receiver is a Bell telephone connected to the induced wire of a Ruhmkorff coil, the battery currents being passed through the primary wire. With pretty strong currents words can be heard 50 or 60 ctm. from the mouth of the telephone, and musical sounds several metres off.—The vibrations of matter and the waves of the ether in ebullition, by M. Favé.—Report on a memoir of M. Haton de la Goupillière.—On the lines generated in movement of a plane figure.—On some consequences of the constitution of the solar spectrum, by M. Cornu. If the sun's outer layer contain, like aerolites, a large amount of iron vapour, this metal probably has an appreciable action on our terrestrial magnetic

phenomena. The central part of the earth seems to be formed of much denser materials than the crust, probably metallic matter; and the probable common origin of bodies of the solar system seems to point to iron being largely present, which would explain the earth's action on the magnetic needle. Again, the solar protuberances may correspond to illumination by induction (large magnetic masses being in rapid motion) of rarefied gaseous masses—an illumination easily produced in our laboratories by means of the weakest mechanical actions.—On differential actions of the first order and the first degree, by M. Darboux.—On the temporary variation of permanent magnetism, by M. Gauguin.—When a system (tube and core, or even full bar) magnetised at ordinary temperature is raised to 300° or 400°, the weakening of the magnetism is not exclusively due to a part of this magnetism being destroyed; it arises in part from the *inverse* magnetism being developed in the tube under influence of heat.—On the action of fluoride of boron on organic matters, by M. Landolph.—Transformation of bromated hydrocarbons of the series of ethylene into bromides of acids of the fatty series, by simple addition of oxygen, by M. Demole.—Analysis of the sulphurous waters of Aix, in Savoy, and of Marlioz, by M. Willm.—Action of oxygen on anatomical elements, by M. Bert. These elements are nourished by reducing the oxyhæmoglobin combination (and similarly to the butyric ferment); but if their substance be penetrated artificially with chemically free dissolved oxygen, they become incapable of taking oxygen from the matter which furnished it before, and die by a kind of asphyxia; in a word they are *anærobies*.—On local variations of the pulse in the forearm of man, by M. Mosso. He experiments with a *hydrosphygmograph*, which is a modification of his plethysmograph. The effects during intellectual effort, sleep, &c., are described.—On lactic fermentation of sugar of milk, by M. Richet. It seems that the gastric juice, by its dissolving action on caseine and perhaps another action yet unknown, gives lactic fermentation a surprising activity and rapidity.—Classification of Cestoides, by M. Perrier.

VIENNA

Imperial Academy of Sciences, January 3.—On the velocity of propagation of spark-waves, by MM. Mach, Tumirz, and Kögler.—On orthogonal substitutions and some related to them, by M. Igel.—On ballooning, by M. Ettalp.—Three experiments with the telephone, by M. Sacher.

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